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THE AGROTIS SUBGOTHICA OF HAWORTH, AGAIN.

BY M. V. SLINGERLAND, CORNELL UNIVERSITY, ITHACA, N. Y.

In the CAN. ENT. for November, 1895 (Vol. XXVII., 301-307), I discussed all the evidence then accessible to me in regard to the identity of this insect. According to Prof. J. B. Smith, our American authority on American Noctuids, I showed "very conclusively that *subgothica*, Haw., is correctly used for our American species" (CAN. ENT., XXVIII., 4). However, Mr. J. W. Tutt, who has written much about British Noctuids, in an opinionated reply (CAN. ENT., XXVIII., 17), tries to prove that Haworth described a variety of *tritici*, a well-known European (not an American) insect. After a careful study of several authentic specimens of *tritici*, representing nearly as many varieties, from Dr. Staudinger, and after considerable correspondence with both English and American lepidopterists who are familiar with *tritici*, I became convinced that the species, in any of its numerous variations, never approaches near enough to what Americans have called *subgothica*, Haw., to be easily mistaken for the latter; their antennæ are quite different structurally. But Mr. Tutt states: "I can match exactly the specimens which Stephens figures, and Humphrey and Westwood copy, with undoubted genuine specimens of *Agrotis tritici*." Naturally, I was anxious to see one of these specimens, and, under the circumstances, I anticipated that a request to examine one of them would be readily granted. My first polite request remaining unanswered, I wrote a second time, but, as yet, Mr. Tutt has not even replied to either request. The above facts, and especially those which follow, I think demand that Mr. Tutt publish a photographic illustration of one of these specimens of *tritici* var. that it may be compared with the figures on my plate in CAN. ENT. for November, 1895, and especially with the two on the plate accompanying this article.

The following extracts from an interesting and valuable letter, written in response to several of my queries, by one of England's most respected lepidopterists, will throw much light on some obscure points and straighten out some of Mr. Tutt's misconceptions: "Stephens's and Wood's figures

seem to me to be made from a specimen, probably from the same specimen, of genuine *subgothica* of American writers. Humphrey's figure possesses the curious character, so conspicuous in *subgothica*, of an oblique pale stripe running from the median nervure immediately below the stigma. This is curious, because no tendency toward such a marking shows itself in the varieties of *tritici*."

"Mr. Raddon, who was mentioned as the person spoken severely of by Doubleday, was a respectable gentleman, an engineer, living at Bideford, on the west coast of Devonshire. He is famous in English lepidopterous history as the discoverer of *Deilephila euphorbiae* in the larval state in numbers on some extensive sand burrows near Barnstaple. Bideford and Barnstaple are on opposite sides of the estuary of the Taw and Torridge; and from these two far-western ports extensive trade was carried on with America back to the days of the buccaneers and Sir Francis Drake. Consequently, my firm belief is that these and other American insects arrived there among timber or other produce, and naturally enough were picked up by Mr. Raddon as genuine 'Britishers'."

"I have written about Mr. Raddon to perhaps our oldest living collector, Mr. S. Stevens. He replies: 'I suspect that I am the only living entomologist who can give you any information about the late Mr. Raddon. Between 1837 and 1844, I used to meet him occasionally at the meeting of the Entomological Society, when he came up to London and brought a few of the insects that he had bred and captured. He died in the spring of 1848. I happened to be staying at Ashburton, South Devon, in August that year, and on receiving a letter from my brother, went to Bideford to see to packing up the collection, which was sold in October of that year.' Mr. Raddon was believed in then, and probably with justice. Was Raddon a collector as early as 1810? Yes, his first capture of *D. euphorbiae* was in 1806, his largest haul of it in 1814."

"There is no reason to suspect that Haworth knowingly described as British any species which was not so, but unwittingly he certainly did. It is not possible always to sift out a statement, and there were collectors then who were willing to astonish their friends with insects that they certainly had not captured. I think that this does not apply to the original specimens of *subgothica*."

Thus, contrary to Mr. Tutt's surmises (pp. 17 and 21 of his paper), Mr. Raddon began collecting insects before 1810, when Haworth described *subgothica*, and until after 1829, when Stephens wrote. It is not impossible,

then, that Haworth's material came from the same source as Stephens's. On page 22 of his article, Mr. Tutt tries to show that the specimen of *subgothica*, Haw., of American writers, found by Mr. Barrett in the old Burney collection, was not likely to have been obtained by Mr. Burney in Haworth's time. However, Rev. R. A. Burney, who was born in 1775 and died in 1836 (three years after Haworth's death), was an ardent collector of insects for 30 years. His collection went to his son, Mr. H. Burney, who continued to collect for over 30 years. It was the latter Burney who died in 1893, but the specimen of *subgothica* recently found by Mr. Barrett (Ent. Month. Mag., XXV., 223) originally came, as he distinctly states, from the collection of the elder Burney, who *was* a contemporary with—and could have and did, Mr. Barrett says, correspond with—Haworth. In regard to the Burney collection, one of England's most noted lepidopterists writes me: "To call his collection a 'scientific lie' is worthy of the person who wrote it. The vast majority of his insects were genuine enough. A few of doubtful nativity were in the collection, but he had removed the most glaring species which had been imposed upon him, and, I think, destroyed some of them."

The above facts show that there could have been and that there was at least one (Haworth himself states he had seen his species in three museums or collections)—Burney's—specimen of the *subgothica* of American writers in English collections in Haworth's time; as Mr. Raddon collected before 1810, Stephens's specimen might also have been one of those seen by Haworth. In the light of the above facts, and especially in connection with what is to follow, it would seem that Mr. Tutt's sarcastic remarks in the closing sentence on page 22 and in the first sentence on page 23 (CAN. ENT., XXVIII.), might equally as well be applied to his own arguments in this discussion; but sarcasm is not science nor logic.

I consider myself fortunate in being able to draw most of my information from English sources, for I thus escape Mr. Tutt's allegation that no American entomologist had or has the slightest knowledge of the British Noctuids. As a final argument in support of my claim that Haworth's *subgothica* is an American insect and not a variety of the European *tritici*, I have to offer a British picture, shown in the lower half of the plate. This photograph was taken by Mr. Gepp, in the British Museum, under the direction of Mr. A. G. Butler and Mr. C. O. Waterhouse. It purports to be a likeness (twice natural size) of Haworth's

original type specimen of *subgothica*! Its authenticity is vouched for by Mr. Butler in the following letter to the writer:—

"Mr. Waterhouse suggested to me that as Stephens purchased part of Haworth's collection, it was possible that the original type might be in Stephens's collection *now*. I thought it hardly probable, for the very reasons urged by yourself; but *there it is*, or at any rate a specimen labelled in Haworth's style and in his writing.

"All of Haworth's types are ticketed in the same way (note the peculiar triangular label and the printing of the name in the picture on the plate). Of course, italic writing is much alike whoever does it, but I should do it differently from Haworth [here Mr. Butler gives his style]. Old Smith, in his labels, differed again [a sample of Smith's style is here given]. In Haworth's label the *s* and *b* are the most distinctive features. I have no doubt that the Stephensian specimen is Haworth's type.

"The type of *subgothica* has a strongly pectinated antenna (see the picture), but examined through a lens this antenna is clearly seen to be glued on to the right eye. It does not belong to the specimen, which is undoubtedly identical with *A. tricos*a, Lintner.

"Stephens's figure cannot have been made from Haworth's type; indeed, it is stated to have been drawn from a specimen in the possession of Mr. Raddon. Collectors were easily gulled in the days of Stephens, and doubtless anybody who cared to pay for Haworth's species to complete his '*British*' collection could get something quite near enough to represent it. Stephens's figure is evidently taken from a specimen of the same species as *Feltia ducens*, Walk. (All recognize this as equal to the *subgothica* of American writers.)

"We have a whole drawerful of Haworth's types, and in every instance the labels are cut in the same peculiar way (see figure); also in every label on which the letters *s* and *b* exist they are formed precisely in the same manner. There is, therefore, not the least doubt that the specimen in Stephens's collection is the type and that *A. tricos*a, Lint., must be called *subgothica*, Haw."

As Dr. Lintner, the author of *tricos*a, has kindly given me a type specimen of his species, I am able to present, in the upper half of the plate, a picture of it, twice natural size, for comparison with the picture of Haworth's type of *subgothica*. Both Dr. Lintner and Prof. Smith agree that the photographs represent insects of the same species. I think a careful study of Gueneé's descriptions, and especially of his figure of

jaculifera, will show, what most lepidopterists admit, that he had three species before him, from which he deduced a type description and two varietal descriptions.

Thus, to summarize, I believe that the evidence given in and brought out by my former paper, with the new facts brought out in this communication, demonstrates beyond any reasonable doubt the following final synonymy for these three much-discussed species:—

Feltia subgothica, Haw.

triosa, Lint.

jaculifera, var. A, Gn.

Feltia jaculifera, Gn.

subgothica, of Stephens, Wood, Humphrey, and all American writers.

ducens, Walk.

herilis, Grt.

jaculifera, var. B, Gn.

FURTHER ADDITIONS TO MY 1894 LIST OF WINNIPEG
BUTTERFLIES, WITH NOTES FOR SEASON OF 1896.

BY A. W. HANHAM.

Neonympha eurytris, Fab.—Two. June 23rd and 26th. Both captured in Elm Park, near the City. These specimens differ somewhat from some I have taken near Quebec City. They are also larger.

Carterocephalus mandan, Edw.—Two. June 18th and 20th. The first in Elm Park.

Pamphila hobomok, Harr.

var. *pocohontas*, Scud. Several in Elm Park, June 18th to 23rd.

The spring was a wet one and the early summer not much better, notwithstanding which this season has been a richer one for diurnals than last. Several visits were made in June and early in July to the locality where the *Phyciodes*, sp., was found in 1894, but nothing but *tharos* was seen.

Pyrameis atalanta, Linn.—This butterfly was unusually abundant here early in the season.

Limenitis arthemis, Dru.—Quite plentiful.

Debis portlandia, Fabr.—This beautiful insect was very abundant throughout the district, and especially so in Elm Park from June 26th to July 3rd (in perfection), and I even took a fine specimen in my back kitchen.

Satyrus nephele, Kirby.—The form *Boöpis* occurs here.

Colias interior, Scud.—A fresh specimen taken near Bird's Hill on July 8th and a second seen.

Colias eurytheme, Bdv.—Very abundant this season from beginning of August until middle of September.

Papilio asterias, Fabr.—A worn ♀ near Bird's Hill on June 29th. No *P. turnus* noticed in the district since 1894.

Pamphila metacomet, Harr.—One. Bird's Hill, July 7th.

Amblyscirtes samoset, Scud.—June 18th. Abundant in Elm Park. Examples not very fresh.

Eudamus tityrus, Fabr.—One seen June 29th near Bird's Hill. I find this a very difficult thing to net.

On July 9th I went to Brandon, Man., for a few weeks and enjoyed some good collecting, but did not get out often for butterflies.

On July 26th and August 2nd, *Argynnis Cybele*, *Cipris*, *Lais* and *Bellona* were seen in abundance. *Colias eurytheme*, var. *eriphyle* and *Keewaydin*, were very common everywhere during my stay, and on August 2nd I captured a fine ♀ (albino).

Euptoieta claudia, Cram.—One. August 2nd. In fine condition.

Thecla titus, Fabr.—Plentiful in one locality on the prairie August 2nd. No bush near at hand.

Lycæna melissa, Edw.—Occasional. July 13th to August 2nd (♂s).

Pieris protodice, Bd.-Lec.—Several taken at Brandon are in the collection of Mr. H. W. O. Boger.

Papilio asterias, Fabr.—One. August 2nd.

Thymelicus garita, Reak.—Common. Worn specimens on wing as late as August 2nd.

Pamphila manitoba, var. *assiniboia*, Lyman.—August 3rd. One (fresh), at rest on a yellow flower in the evening (♂).

A REPLY TO PROF. SMITH.

BY A. RADCLIFFE GROTE, A. M., HILDESHEIM, GERMANY.

With regard to *Mamestra comis*, the whole question as to the setting of the type has been introduced by Prof. Smith, and I submit that this has nothing to do with the matter. I have merely shown that Prof. Smith's statement that the type of *comis* was "typical *olivacea*, but so set as to make it appear differently marked," etc., is inaccurate and impossible, as my description refers to colour and marking, and these cannot be produced by any freak of setting. As I failed to notice any peculiarity of setting in my type, it is probably not very obvious, and as now described by Dr. Smith, must be very slight. I call further attention to the fact that in colour and marking the description of *circumcincta* agrees well with mine of *comis*. I believe, therefore, it possible that *circumcincta* is *comis*. I do not assert it—I have not seen the type of *comis* since the seventies—but I think it possible, nay, probable. Mr. Beutenmüller writes me that the type of *comis* differs more from "typical *olivacea*" than the type of *circumcincta* does. I want these types examined by some competent person who can settle the matter as to whether *comis* is a variety of *olivacea* or not, and what the standing of *circumcincta* really is as compared with either. That *comis* is not "typical *olivacea*" seems now virtually admitted by Dr. Smith, and this is in reality all my contention, and that no amount of abnormal setting can produce differences in colour and marking. This closes my case as to *Mamestra comis*.

Now, as to the type of *Agronoma*, which is *crassa*. If *crassa* agrees with the type of *Porosagrotis* I am glad to hear it, and we shall get a little more light into the matter. The reason I wrote that the front was roughened and tuberculate was that I felt it with a pin's point. My microscope I left behind in America, and there is none in the museum here. I could not distinguish, with the pin, between tuberculate and roughened. *Crassa* does not belong to *Carneades*, because the antennæ are pectinate, and in my opinion the structure of the antennæ offers points of generic value. I have therefore not been able to compare *Feltia* and *Agronoma* as closely as I should have liked; first, because I had no species of the former; secondly, no microscope. But the work of bringing the groups of North American *Agrotis* into correspondence with the European progresses, nevertheless, as we see. That *Feltia* should not be represented in Europe seems not likely, since Haworth's name *subgothica* is held by Mr. Tutt to represent a variety of *tritici*, by Dr. Fitch to be *jaculifera*. In a little

while I hope to get it all straightened out, and I am glad that my original proposal to separate first the species of *Agrotis* with unarmed tibiae has been adopted in his revision by Dr. Smith. I may say, in conclusion, that it is the property of all changes in the synonymy, whether proposed by me or by Prof. Smith, that they should be verified and that they are subject to examination. I have been showing reasons why some of Prof. Smith's changes are not to be followed.

A MEXICAN ALEURODICUS.

BY T. D. A. COCKERELL, MESILLA, N. M.

Aleurodicus Dugesii, n. sp.—Length, $1\frac{2}{3}$ mm.; length of anterior wing, $2\frac{1}{4}$ mm.; its greatest breadth nearly $1\frac{1}{2}$ mm. Pale grayish-ochreous, covered with white meal, abdomen beneath shining silvery. Wings white; upper wings iridescent, with markings similar to those of *A. ornatus*, but very pale gray and quite different in detail. There are four gray bands crossing the wings, of which only the third and fourth are joined by a longitudinal band. The first (basal) band bends abruptly inwards after crossing the main nervure, which branches so near the base of the wing that there are practically two nervures, the first gray band failing in the angle between them, but strong again beyond the second. Second gray band broad as far as the first nervure, just beyond it interrupted broadly, but continued as a large, nearly circular, gray patch, the greater part of which is above the second nervure, and passing thence as an oblique narrow band to the margin. Third band resembling the second as far as the first nervure, which it meets at its fork; after that failing, but reappearing strongly a little way down the lowest branch of the nervure and thence passing downwards, becoming very faint. Fourth band broad, passing across the end of the fork, bent inwards, joining the continuation of the third band after the break, itself forking at its lower end. The curve of the fourth band leaves a white apical area in which there is a gray spot. There is also a gray spot at the tip of the second nervure.

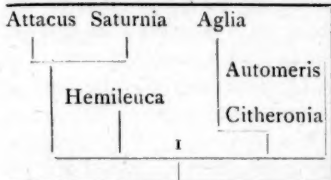
The pupæ occur on the under sides of the leaves and are of the usual type—oval, flat, pale ochreous, with white mealy powder.

Habitat.—Guanajuato, Mexico, on *Hibiscus rosa-sinensis*. Sent by Dr. Alfred Dugès in great quantity. Dr. Dugès writes that it is also found on the large-leaved *Begonia* and other plants, and it does not appear to do them a great deal of harm. It is the first *Aleurodicus* described from Mexico, and is most nearly allied to the Jamaican *A. ornatus*, Ckll. The genus now includes five species, all neotropical except the U. S. *A. asarumis* (Shimer, 1867).

NOTES ON THE PHYLOGENY OF THE SATURNIANS.

BY HARRISON G. DYAR, PH. D., NEW YORK.

Mr. Grote's remark (CAN. ENT., XXVIII, p. 294) that the stinging spines of *Hemileuca* and *Automeris* may have been separately evolved is not in accordance with my views, and I wish to compare his genealogical tree of the Saturnians with the larval characters more at length than was possible in the review of his paper, "Die Saturniiden." I reproduce first his tree: At 1 there is a dichotomous division, the genera on the right having vein IV_2 in the middle of the cell or but slightly moved (generalized);

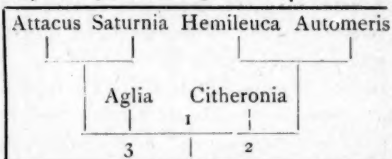


those on the left with vein IV_2 considerably moved toward IV_1 . It is not proved that this movement of IV_2 took place only once in the Saturnians, but it is so assumed, and the construction of the tree depends upon the assumption.

Next I present a tree founded on larval characters, using the same generic types. At 1 is a dichotomous division, the larvæ on the right retaining the unpaired tubercle on joint 13 and losing those on the anal plate; on the left losing the unpaired tubercle and retaining the pair on the anal plate.

At 2 is another division, the two genera above acquiring stinging spines, while *Citheronia* remains without them.

At 3 the stem of *Attacus-Saturnia* acquires many haired, reduced tubercles, while *Aglia* retains the single haired primitive condition and degenerates.



A comparison shows that these two trees are contradictory, the position assigned to *Aglia* and *Hemileuca* being almost exactly transposed. Yet, if rightly interpreted, there should be no contradiction between larval and imaginal characters.

If Mr. Grote's tree is correct, *Aglia* must have reacquired tubercles on the anal plate, because it is derived from the stem of *Citheronia* after *Automeris* was thrown off, and neither of these genera possess these tubercles. Likewise, *Hemileuca* has independently lost these tubercles, unless we suppose that originally they were not present, but were acquired separately by *Attacus-Saturnia* and *Aglia*. This can not be, however, as

the tubercles are primary, not recently developed structures. *Automeris* and *Hemileuca* must have separately acquired stinging spines and not from "an initiatory existence in a common ancestor," as Mr. Grote puts it, because there is no such condition in *Aglia* or *Citheronia*, which are placed between them, nor any evidence that these genera are derived from wart-bearing ancestors, a condition necessary for the multiple spine formation. I regard these conditions as very improbable.

If my larval tree is correct, *Aglia* has remained more nearly in the primitive condition in regard to vein IV_2 in that this vein is only slightly moved toward IV_1 . Yet, it is somewhat moved, which weakens Mr. Grote's point (see the fig. *Die Sat.*, p. 19, fig. 8). *Hemileuca* has followed out the same process separately; derived from a common stem with *Automeris*, vein IV_2 has moved close to IV_1 separately from the *Attacus* branch. *Hemileuca* is separately specialized in this respect.

Some collateral evidence may help to a conclusion. If these moths be separated on the position of the wings in rest, the wings folded over the back in the shape of a roof or with the upper faces together (as in butterflies) a tree results like the larval one. In the hind wings there are two anal veins in *Hemileuca* and *Citheronia*, the rest have one. A tree constructed on these characters (which I believe to be as good as the one selected by Mr. Grote) would be different from either. To reconcile it with my tree, it must be supposed that the left-hand branch had lost one anal vein, while *Automeris* on the right branch also lost it, but separately. To reconcile it with Mr. Grote's tree, three separate losses of anal vein must be supposed, viz., in *Automeris*, *Aglia*, and *Attacus-Saturnia*. My view is here the simpler.

As to the pectinations of the antennæ in the male, those of *Hemileuca* only have simple branches; in the female only *Attacus-Saturnia* have them double. Mr. Grote may suppose that the original ancestor had single pectinations in both sexes, retained in *Hemileuca*; the right branch acquired double pectinations in the male, while *Attacus-Saturnia* separately acquired them in both sexes, which seems improbable.

In my larval tree the ancestor must have already possessed double pectinations in the male, which became transferred to the female also in *Attacus-Saturnia*, but were lost by degeneration in the male of *Hemileuca*. It is true that this supposition can also be applied to Mr. Grote's tree, so that we are not greatly benefited by the consideration. Other characters will have to be compared; but this I will leave to Mr. Grote, with the

hope that he will examine the matter thoroughly. I believe he will find that the true natural classification is not far from that which I have indicated on larval characters.

Finally, this is perhaps as good a place as any in which to protest against Dr. Skinner's remarks in a recent number of the *Journ. N. Y. Ent. Soc.* Dr. Skinner says: "I may say right here that I believe the imago the culmination of nature's efforts, and that while studies of transformations are most valuable, they will not solve the problem of specific difference or identity." This is not the view of a careful student of the subject, but reads like an excuse for neglecting studies of the early stages. As if the *larva* were not often the "culmination of nature's effort," as in *Apatela* or the *Limacodidae*, or as if the forces determining the struggle for existence must always impinge most strongly on the same stage in all species.

DESCRIPTION OF TWO REMARKABLE ABERRATIONS OF *COLIAS PHILODICE*.

BY DWIGHT BRAINERD, MONTREAL.

We were fortunate in taking a very peculiar pair of *Colias philodice* this summer. They were captured at Edgartown, Mass., in a little salt marsh, August 10th and 14th respectively, and, though hatched during the hot wave, we believe are blood relations—part of a sport brood.

Many specimens were examined at the time, but no other departures from the type found.

Number one is a male very similar to the melanic variety figured by Mr. W. H. Edwards on Plate III. of *Colias* in *Butt. N. A.*, second series. The colouring on trunk and appendages is normal, except that pile on dorsum is mouse-gray; the collar a more decided brick-red than usual, and the yellows, where present, match the deep chrome on wings.

When caught, the whole upper surface (with exception of a dusting of yellow on costal margin of the primaries and a pallid green-white strip on the secondaries from costal margin to and following the radius for three-quarters of its length, gradually becoming obsolete) was a deep bottle-green. On drying, the marginal bands, both wings, appeared as a slight, but uniform, reddish-purple stain, the indentations regularly lunulate, and the nervules came prominently out in dull black lines.

The spot on discal vein of fore wings is present and distinct, but a dark blotch replaces the usual orange patch on secondaries. The rosy marginal line is as in type.

Our plunder this season was all attacked by pests, necessitating a severe cyaniding. Much of the brightness in this butterfly was lost, the colour now resembling the brown leaf-green of oak trees late in August.

Scales on the under side are very heavy, there being no suggestion of a band; the extra mesial spots on primaries are almost wanting, and the general ground colour is a deep chrome. A thick daub of this paint from a good box duplicates it exactly.

On the basal half of the disk in secondaries there is a suggestion of green, and extended from that portion of the primaries covered by the lower wings when at rest, which is of the pallid hue mentioned above, nearly covering the outer half of discal cell, thence interspacing the media and cubitus to the mesial spots, from which it bends sharply to the outer angle, reaching the margin at lower branch of cubitus, there is an overwash of black. This is deepest at its inner border and curiously shaded as it blends with the chrome. The whole lower surfaces, with their bright tips and bold opaque colours, are very handsome.

Number two is a female, pallid above, like a white female, except that the black margin reaches from the discal vein, on the costal side follows the radius, joining margin at its first branch and posteriorly defines the media as far as the border. The outer portion of disk and the costal margin on primaries are more or less splashed with dark scales, while on secondaries the marginal band is only indicated by a dusting on edges of the veins.

Underneath the spots are much exaggerated. On the primaries they appear as large triangular black stains, with apices reaching further and further towards the base until between radius and media they touch the discal spot. On the lower wings this stain is ferruginous, shading to green, and practically covers the disk. The unusual size of these spots outlines a white marginal band, the distinctive feature of the specimen in question.

THE ACADEMY OF SCIENCE, ST. LOUIS, MO.

At the meeting of November 2, Mr. Colton Russell spoke of "What an Entomologist Can Find of Interest about St. Louis," illustrating his remarks by numerous pinned specimens of insects, giving particular attention to the butterflies, and speaking at some length of the phenomena of periodicity, migration, polymorphism, etc., as illustrated by these insects, his paper embodying the result of a large amount of field work performed during the last ten years. Resolutions opposing the passage of the Antivivisection Bill now before the United States Senate were adopted. Three persons were elected to active membership.

WM. TRELEASE, Recording Secretary.

NOTES ON THE LIFE-HISTORY OF CERURA
OCCIDENTALIS.

BY HARRISON G. DYAR.

These notes are to complete the partial account of the life-history given in Dr. Packard's monograph.

Egg.—As usual, hemispherical with a flat base, dark black-brown, not shining; diameter 1.1 mm., height .7 mm. Reticulations neat, distinct, rounded hexagonal, smooth, not elevated, the enclosed spaces densely coarsely granular, serving to make the smooth reticulations conspicuous. Laid singly on a willow leaf.

Stage I.—Head bilobed, rather square; red-brown, the ocelli darker; width .5 mm. Dorsum of joints 3 to 12 continuously broadly greenish-yellow, the rest of the body purplish-brown; tails darker, blackish toward the base, with two sordid white rings. Cervical horns and tails spiny. Setae normal, i. to v. and leg-plate present on the abdomen, i. a and b, ii. a and b, iv. and vi. on thorax, vi. double, ii. b not very evident. At the end of the stage the yellow band is slightly constricted at joints 6-7 and 11, horns, cervical shield, anal plate and tails darker than the now vinous body. Head light red; abdominal feet whitish, thoracic blackish; no marks.

Dr. Packard's descriptions of stages II. and III. are comparative only, so I give my notes in full.

Stage II.—Width of head .9 mm. Medial suture deep; all red-brown, uniform, smooth, the clypeal tubercles marked by yellowish dots. Dorsum to spiracles vinous brown except a yellow patch on joints 3-5 and 7 post.-10 ant., the now dark parts of the former yellow band smoky olivaceous; subventral region and legs pale yellowish; two yellow rings on the tails. Tubercles distinct, setae dark. Cervical horns slightly spinose; length of tails 2.8 mm. During the stage the larva suffers an entire change in markings, resulting as follows: Green, an incised dorsal brown band triangular from the horns to a slight fold on the anterior part of joint 3, elliptical on joints 4 to 11, widening to the anal plate, with a very slight retraction at the incisure of joints 11-12. A yellow patch on joints 7 post.-10 ant.

Stage III.—Width of head 1.5 mm. At first much the same as at the end of stage ii. Later head reddish-brown with many pale yellow dots over the lobes; pale behind the brown ocelli. Body bluish-green, dotted with white and yellow and shaded with white in the region of the

feet; dorsal band light brown, scarcely yellowish in the centre of the large patch, slightly frosted with purplish, darker on the edge and with a narrow yellow border. The band is retracted at joint 4 to the slight single dorsal fold on joint 3 posteriorly, reaches the spiracle on joint 8, not conspicuously incised on the folds, retracted at joint 11 posteriorly, then nearly straight to the anal plate. Tails with two greenish-yellow rings; horns spiny, setæ stiff.

Stage IV.—This has not been previously described. The larva which I bred to fourth stage had the proper width of head (2.5 mm.), but it exhibited smooth cervical horns and the other characters of the final stage, thus maturing with only four stages. The coloration was as described for the full-grown larva. The structures on joint 3 which Professor French calls "tubercles" consist of a fold of skin divided by a dorsal depression into two rounded humps, not bearing any setæ.

Stage V.—Other larvæ found when full-grown had a width of head of 3.1 mm., thus indicating that five stages also occur. Dr. Packard quotes Prof. French's description of this stage, which has been already published in CAN. ENT., XIII., 144.

BOOK NOTICES.

ECONOMIC ENTOMOLOGY for the Farmer and Fruit-Grower, and for use as a Text Book in Agricultural Schools and Colleges; by John B. Smith, Sc. D. Philadelphia: J. B. Lippincott Co., 1896. (Price, \$2.50.)

It is rather remarkable, when the self-evident importance of the science of economic entomology is considered, that until Professor Smith issued his excellent manual, which has just appeared under the above title, there was no one American book which a farmer could consult to find the names and proper remedies for the common crop pests which would come regularly before him in a year's working of his land. The author, in his long experience, first as a member of the staff of the United States Entomologist at Washington, and subsequently as State Entomologist of New Jersey, has had great opportunities of becoming thoroughly informed on his subject. That he has made the best use of these opportunities is evidenced by the excellent book which he has now produced. The best way to test anything is to use it. Thus, if anyone wishes for information upon anything within the limits of economic entomology, the subject of

Prof. Smith's book, as, for instance, some one of the regularly occurring insect enemies of crops, *e. g.*, cutworms, white grubs, canker worms, the Colorado potato beetle, plum curculio, or tussock moth, etc., etc., let him turn it up in the index of this work and he will be referred to a clear and concise account of the insect and its habits, together with recommendations as to the best remedies. The identification of the different species is made easy by a profusion of remarkably good illustrations. The whole book, including the index, consists of 481 pages, while the number of illustrations is no less than 483, all of which are unexceptionable, if a mental reservation may be allowed as to the three plates of bumble bees and bee flies, Nos. 398, 464, and 473, taken evidently from photographs. It seems a pity that these plates should have been included in this work on economic entomology. They were made from very badly mounted specimens, and have no special reference to the text. The arrangement of the book, for ease of reference, is well planned and well carried out, the objects the author had in view, as explained in the introduction, being adhered to in a most satisfactory and complete manner. Part I. consists of eight short chapters on the Structure and Classification of Insects. Part II., the Insect World, which forms the bulk of the book, is a systematic treatment of the various common injurious insects in their natural orders. This portion is particularly well-balanced, enough space being devoted to each species treated of to satisfy the inquirer, without, as is sometimes the case, giving undue importance to some at the expense of others. Part III. treats of Insecticides, Preventive Remedies, and Machinery. This work cannot fail to prove of great value to the farmer and fruit-grower, as well as to the amateur gardener and student of insect life, who will find in it an authoritative book of reference of small size but comprehensive and easy to consult.

J. F.

MISSOURI BOTANICAL GARDEN — SEVENTH ANNUAL REPORT, 1896.

Very few reports are more eagerly looked for every year by those who are lucky enough to secure copies than Prof. Trelease's report on the Missouri Botanical Garden and the Henry Shaw School of Botany at St. Louis, Mo. This report contains not only the Director's annual statement on the condition of the Garden and its finances, but also valuable monographs on different genera of plants. In the present volume we find the following: (1) *The Juglandaceæ of the United States*,

by Prof. Trelease ; (2) *A Study of the Agaves of the United States*, by A. Isabel Mulford ; and (3) *The Ligulate Wolffias of the United States*, by C. H. Thompson. A feature of all these annual reports is the magnificent illustrations.

In addition to the above there is the report of a speech delivered at the sixth annual banquet, by President Henry Wade Rogers, of the Northwestern University, on "The Value of a Study of Botany," and a catalogue of the Sturtevant Pre-Linnean Library, the greater part of which was presented to the Botanical Garden by Dr. E. Lewis Sturtevant in 1892.

One very notable omission from the present volume, which we much regret, is the printing of the annual "flower sermon." Last year it was delivered by the Rt. Rev. W. C. Doane, Bishop of Albany.

The first annual event provided for in his will by Henry Shaw, the good man who founded this garden for the enlightenment and happiness of his fellow-men, was "The preaching of a sermon on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other productions of the vegetable kingdom." A lovely poem in prose, for the perusal of which by his friends the writer's copy of the 1893 report is in constant use, is a sermon preached by the Rev. Cameron Mann from the text, "Consider the lilies of the field." This sermon, from a literary standpoint, is charming, and certainly helps to carry out the wise wish of the benevolent founder to inculcate in all a thankful spirit for the many lovely things in the vegetable kingdom which we find strewn with no niggard hand along our walk through life, making our own journey more beautiful and, it is hoped, our friends happier from contact with us.

J. F.

THE CRAMBIDÆ OF NORTH AMERICA ; by C. H. Fernald, A. M., Ph. D., Mass. Agr. College. Jan., 1896. Pp. 81, with six plates.

This latest work is characterized by the painstaking study which Prof. Fernald has taught us to expect in his publications. The statements are well considered ; the very words carefully chosen, so that there are few writers whom we may so entirely and unhesitatingly trust. Conscious as I am of my own shortcomings, that attention has been called to the "extreme desirability of verifying my statements when they involve a change in nomenclature or in synonymy," it is like an atonement for my thirty-five years of labour, without any merit of my own, that I reached so unimpeachable an observer as Prof. Fernald a friendly hand

at the beginning of his career among the little moths. And it is grateful to me, but quite out of the usual course, that Prof. Fernald should have remembered the circumstance. I thank him heartily. As I sat down to write this notice and was seeking for the proper words, a letter was brought in from a well-known and able German writer on the "*Tineides*," thanking me for sending him a copy of "Prof. Fernald's full and satisfactory work on the American Crambidae." It is certainly exactly this, and I need not seek further for adjectives. The appearance of being written quite easily, which Prof. Fernald's work bears, is deceptive. It has been all thought out and written over.

My own studies in the Crambids may give a little weight to a word of general praise and entitle me to offer some comments. The synoptic table and exact definitions will enable the student to identify his material even without the aid of the finely drawn and delicately coloured plates (the figure of *edonis* is perhaps too delicately coloured—I miss the "salmon pink"). But here and there we might easily have had, in addition, more comparative details, to enable one to seize readily important characters and bring the inter-relationships to light. The sequence of the descriptions of the species of *Crambus* is not that of the synoptic table, and it is not clear upon what principle it is laid down. In the absence of structural characters, we have the markings upon which to group the species. First there are the white species (*perlellus*, *girardellus*, etc.), reminding us of *Argyria*. Then the leather-brown species, with a white median stripe cut into blocks, *myellus*, *luctuellus*, *dissectus*. Then what may be considered the typical Crambids, species with gilded and fuscous primaries, with longitudinal subcostal satiny-white striping, *satrapellus*, *leachellus*, *carpenterellus*, *laqueatellus*, etc., etc.; again, with the stripes wanting, *vulgivagellus*, *behrensellus*, etc. These seem to pass, through forms like *attenuatus*, into the plain, gray, or fulvous species, with double, dark and bent transverse lines, such as *laciniellus*, *caliginosellus*, *luteol-ellus*, *anceps*, *undatus*, etc. Then we have the blackish and white species like *labradoriensis* and *oregonicus*, while a number of peculiarly marked forms lead us, through *dimidiatellus*, to the species of *Thaumtops*. But this rough sketch of a possible arrangement is entirely suggestive. I may conclude with a few words upon three species. On Plate III., fig. 15, Prof. Fernald gives us a representation of *Crambus inornatellus*. But no mention is made of this pale yellowish form on page 43, where it is referred to merely in the synonymy of *perlellus*. It is nearly twenty

years since I went over the literature, but I believe Clemens describes *luteolellus* without the lines. If so, then *duplicatus* might be kept for the form with lines, of which *ula*, according to Prof. Fernald's figure, would be a sub-variety. It was with feelings of perplexity and annoyance that I found, on page 87 of the Philadelphia List, my *Crambus dimidiatellus* referred as a synonym of *T. pexellus*. The beautiful species is now rehabilitated, while I miss, what Prof. Fernald probably thinks is unnecessary, a word upon the circumstance. This is already the fifth name which has been restored to me, and for those who profess to consider such matters sentimental or unscientific, I should say that to me they are very important, and the distress inflicted by a careless or prejudiced reference is real. Schrank, in 1802, uses *Tinea* in the sense of *Crambus*; I miss an allusion to this in the "History," p. 4. Prof. Fernald has given us since 1884, in addition to catalogues and descriptive papers, four pamphlets on the Insects and Grasses, chiefly of Maine and the Eastern States. The fifth is this on the Crambids. I value all of them very highly. They are bound together and, as I turn over the leaves here in my study, separated by such miles of land and water from the one reality of my existence, I call to mind scenes and faces I may never behold again.

A. RADCLIFFE GROTE.

Roemer Museum, Hildesheim, Germany.

CLASSIFICATION OF THE GEOMETRINA OF NORTH AMERICA, with descriptions of new genera and species; by Rev. Geo. D. Hulst. Trans. American Entomological Soc., Vol. XXIII., pages 245 to 386, plates x. and xi. (1869).

The bulk of this paper consists of descriptions of 82 new genera and 143 new species, most of them from the West. That such an assemblage of new forms can be described in a single paper shows the imperfect state of our knowledge of the family.

The most valuable part of Dr. Hulst's work consists in the tabular synopsis of subfamilies and genera. The characters used seem contrasting and reasonably constant, so that these tables fill a long-felt want. In fact, the article forms the skeleton of a complete monograph, lacking only synoptic tables of species with descriptions of the old ones, bibliography and larval descriptions.

Dr. Hulst calls the group Geometrina, but in the opinion of the reviewer this term is not warranted. We may accept Dr. Hulst's two

families, Geometridæ and Ennomidæ, as consecutive groups of the Bombyces, discarding the superfamily term. However, as used by Dr. Hulst, this term may be only a convenient heading for the article.

The author is in some difficulty to separate the "Geometrina" from the other groups of Lepidoptera, and has to fall back on larval characters. He says: "The larva has one or more pairs of the anterior abdominal legs wanting, and they are thus distinguished from the Bombycina in the widest reach of that term." Yet this is not correct, since *Brephos*, included in the "Geometrina," has all the abdominal feet present, while *Nola*, excluded, entirely lacks the anterior pair.

In the classification Meyrick is followed, as Dr. Hulst considers his "in many respects by far the best yet proposed." Hübner's *Verzeichniss* receives recognition, but not the *Tentamen*. However, the *Tentamen* names are included in parentheses, so that any one differing in his opinion of the value of these names may easily apply them.

On the whole, Dr. Hulst's paper indicates a distinct advance in our knowledge of the Geometridæ.

HARRISON G. DYAR.

INSECT LIFE.—A short account of the classification and habits of insects; by F. V. Theobald, M. A., F. E. S. London: Methuen & Co. Pp. 235. (2s. 6d.)

Under the title of the "University Extension Series," the publishers are issuing a number of books on historical, literary, and scientific subjects, which are intended to be both popular and scholarly. We have not seen any of the other works of the series, and cannot, therefore, comment upon them, but the book before us seems hardly to come up to the expectations one would naturally form of a manual intended for use in preparation for "University Extension" lectures. The descriptive portion is meagre, and will afford a student a very vague idea of the insects belonging to the different orders. It is satisfactory, however, to find in an English publication some attention paid to economic entomology and the application of the insecticides which are in common use here. The book is neatly printed (though we have noticed several misprints in the spelling of names) and is illustrated with over fifty wood cuts.

C. J. S. B.

MR. WALTER W. FROGGATT has been appointed Entomologist to the Department of Agriculture, Sydney, New South Wales, Australia, in place of the late Mr. A. S. Olliff, F. E. S.

BRITISH BUTTERFLIES; by J. W. Tutt, F. E. S. London: George Gill & Sons, 1896. Pp. 469. (Price, 5s.)

It is only a few months since we spoke in terms of commendation of Mr. Tutt's Manual of the British Moths, and now we have before us an even better work on the butterflies by the same industrious author. About one-fourth of the book is taken up with the general subject, presenting a series of chapters on the four life-stages of butterflies, their variation and its causes, hibernation and æstivation, classification, collecting, and arranging and preserving specimens, and the inflation of larvæ. These are written in the author's pleasant, easy style, with which his previous works have made us familiar, and convey much information of interest to butterfly-hunters anywhere. We are glad to observe that he insists very strongly upon the importance of labelling specimens with the place and date of capture; though the English mode of using short pins and setting the specimens low down makes this a matter of difficulty.

The descriptive portion of the work is excellent and much more complete than that of any manual of British butterflies that we have met with. In the case of each species there are given the English and scientific names, reference to the plate where it is figured, synonymy and bibliography, a concise description of the imago, a paragraph on "variation" in which are mentioned any known aberrations, forms or varieties, as well as sexual distinctions, descriptions of the egg, larva, pupa, notes on the time of appearance, habitat, and geographical distribution. Thus it will be seen that proper regard is paid to the whole life-history of the insect, and that the author does not confine his attention to the imago alone. The plates (uncoloured) on which each species is depicted are admirable, and should enable any collector to identify his specimens without difficulty; there are also a considerable number of wood cuts throughout the text.

In the arrangement of species the author begins with the "lowest"—the Skippers, Hesperidæ—and proceeds upwards to the Satyridæ, among which he strangely places "the Purple Emperor," *Apatura iris*. His classification, a thorny subject which we do not propose to discuss here, may thus be considered fully "up to date."

To our readers in the British Isles, and to those who have collections of British butterflies, we heartily commend this excellent Manual. We only hope that it may not be very long before we have some handbook equally good dealing with the butterflies of Canada. C. J. S. B.

Mailed December 10th, 1896.

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ERRATUM.—Page 278, last line but one, for "no trace of the spots" read "no trace of *other* spots."